

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

6.1.1 Enforcement

- Videocameras operating alone cannot currently identify the number of vehicle Occupants with enough certainty to support citations for HOV lane occupancy violations. While certain HOV lane infractions, such as illegal buffer crossings, can be identified unambiguously and the license plates of violators can be recorded accurately, the rate of false alarms encountered in using videotape records to document occupancy violations is much too high to support enforcement actions. The chief problem encountered involves the size and positioning of vehicle occupants. Small children and sleeping adults can regularly escape the camera's eye.

Other problems encountered in attempting to document vehicle occupancy through video surveillance included glare, ambient lighting conditions, vehicle size and position, tinted windows, and sight-obscuring headrests and windshield posts. These other problems, however, do not appear to be insurmountable. Some (i.e. glare and ambient lighting) can be solved technologically through the use of filters and continuous camera adjustments. Others simply lead to indeterminate occupant counts which would not trigger a citation. In any case, these problems are not the kind which lead to the mis-identification of violators. They may cause some violators to escape detection, but they should not produce false alarms so long as the videotape is carefully interpreted.

- Video cameras operating in conjunction with officer observation may provide sufficient accuracy to support mail-out citations for HOV lane occupancy violations. An officer stationed downstream from the video cameras is in a position to verify the occupancy of vehicles which appear suspect to observers monitoring camera output. If a system of mail-out warnings or citations can be installed, this officer would not have to pursue violators, and a videotape record of driver, occupancy, and license plate will be available for court hearings. This system is not foolproof, since the roadside officer may fail to see a small child missed by the video monitor, but it appears to have considerable promise. Moreover, the presence of an observing officer may remove some of the "Big Brother is watching" stigma from the use of videotape.

Analysis suggests that a combined system of video recording, officer observation, and citations-by-mail is far more cost-effective than the current system of freeway pursuit and roadside citing. The combined video/observation system should be able to produce the same number of tickets for less than one-third the cost of special overtime assignments to roadside enforcement. Furthermore, by eliminating the need to pursue and cite violators during rush hour, the combined system improves the safety of both officers and drivers and reduces the congestion caused by rubbernecking.

- The use of videotape as a real-time on-line enforcement aid appears to be limited to those locations lacking a median shoulder or enforcement area where an officer can be posted for observation purposes.

The use of videotape as an aid in enforcement activities requiring officer pursuit and on-line citations appears to be somewhat limited. An officer stationed beside an HOV lane in an enforcement area is in a better position to observe violators than an officer stationed in the control van watching a video monitor. Furthermore, the roadside presence of an officer in an enforcement area can have a cautionary effect on drivers. Either officer can radio ahead to pursuit units.

The only locations where an officer in the videotape van might be better able to assist on-line enforcement than an officer on the freeway would be those locations where there is no refuge area adjacent to the HOV lane. If there is no median shoulder or enforcement area where an officer can be situated for enforcement purposes (as in the case, for example, on Marin 101), video-assisted enforcement stops might be considered as an option.

6.1.2 Surveillance

- Individual interpretation of occupancy levels by both roadside observers and videotape reviewers varies widely with the individual and the instrument used. Evidence suggests that roadside observers overstate occupancy violations. While some observers understated the number of vehicles with three or more occupants,

others using different count sheets overstated the number of high occupancy vans carrying six or more people.

- Videotape provides a freeway monitoring tool which is potentially more consistent and accurate than existing techniques for documenting vehicle occupancy. In addition, videotape provides a permanent, verifiable record of the vehicle mix, traffic speeds, and the license plates of violators and carpoolers.

6.2 RECOMMENDATIONS

In view of the improved accuracy of videotape surveillance and the potential promise of videotape as an enforcement tool if used in conjunction with officer observation, it is recommended that CALTRANS and the CHP take the following steps to explore further the potential uses of videotape in HOV lane surveillance and enforcement.

- Test the relative accuracy of a four-camera set-up in conjunction with an observing Officer. Further field tests should be undertaken to explore the relative accuracy of a four camera set-up in a freeway setting. As in past field tests, a downstream officer should verify the occupancy of suspect vehicles. However, as an additional check on the accuracy of the officer/videotape combination, motor officers should be available to pursue and cite vehicles identified as violators by both the videotape observers and the verifying officer.
- Test the impact of mailed warnings on violation rates. Video surveillance should be used in conjunction with a roadside officer to monitor several days of HOV lane operations. Written warnings should be mailed to the registered owners of vehicles identified as violators by both the videotape monitors and roadside officers. The impact of this activity on HOV lane violations should be documented through subsequent videotape surveillance and follow-up surveys. Media support for the demonstration should be enlisted through a carefully designed program of public information.
- Explore the use of videotape on ramp meter bypass lanes. The current study has tested and demonstrated the use of videotape in documenting violation activity on mainline HOV lanes. Similar tests should be undertaken on ramp meter bypass lanes.

- Continue to explore the legislative/legal ramifications of mail-out citations. The CHP should continue to explore the necessary legislative and legal steps necessary to support the use of tickets-by-mail for HOV lane infractions.
- Continue to explore the uses of advanced videotape technology in HOV lane surveillance and enforcement. Two promising avenues of investigation identified through the current research include:
 1. The use of micro-cameras installed in the helmets of motorcycle officers; and
 2. The use of low level infrared lighting installed at freeway level to document vehicle occupancy under conditions of darkness or low visibility.